Technology Like No Other

All photos courtesy of Paul Easker & Iowa State University Virtual Reality Applications Center

Iowa State University's C6 CAVE

Ames, Iowa

At the intersection of humans and technology, Iowa State University's (ISU) Virtual Reality Applications Center (VRAC) finds the highest creativity and productivity, breaking barriers across colleges, disciplines, and industries. In 2000, ISU redefined the concept of collaboration by bridging virtual immersive environments with interactivity and production capabilities.
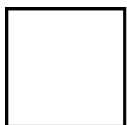
Breaking the Standard

People tend to think of collaboration suites as separate entities - advanced visualization technologies reside in immersive rooms and large-scale presentations occur in auditoriums. Within these suites, people further associate spaces with levels of standardization; immersive rooms have varying levels of flexibility, while auditoriums differentiate solely through architectural design. The most aesthetically innovative auditoriums and creative immersive rooms are limited by the standard premise of how these rooms are used.

In the late 90s, ISU began construction of the multi-million dollar Engineering Teaching and Research Complex for the engineering college, starting with Howe Hall. As the new home for the VRAC, ISU envisioned new ways to differentiate these spaces through innovative collaboration opportunities. The result came in the form of a six-sided CAVE virtual immersive environment, the C6, and the Alliant Energy Lee-Liu Auditorium, connected through direct interaction.

Total Immersion

The new VRAC features a brand new solution never before seen in North America - the six-sided CAVE with wireless tracking featured the world's first fully immersive virtual environment. Completely enclosed between four walls, a floor and a ceiling with four quad-HD projectors behind each wall, the C6 completely revolutionized immersive virtual reality capabilities. Jim Oliver, the director of the Virtual Reality Applications Center, says, "the level of complexity balanced against the absolute pinnacle of immersive resolution is unparalleled."

Mechdyne

ENABLING DISCOVERY

www.mechdyne.com | +1 641.754.4649

Immersion doesn't stop at visualization. The room is equipped with surround sound capabilities, advanced software, and "shutter" technology to enable 3D. By leveraging virtual reality, students and professors create solutions to challenging problems in virtual prototyping, computational fluid dynamics, and interactive simulations. The VRAC provides a way to solve these issues across diverse areas, such as architectural design, manufacturing simulation, and data mining visualization.
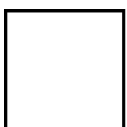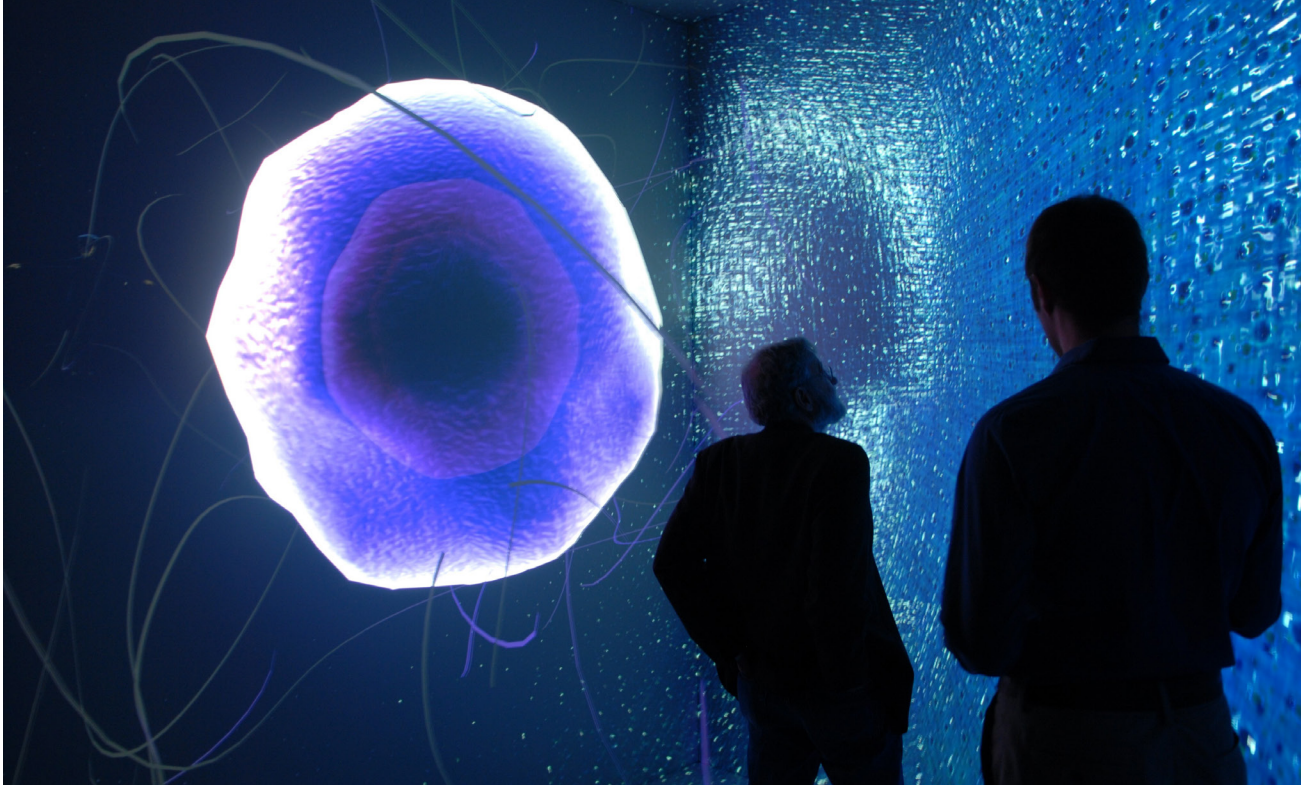
Auditorium and C6 Interaction

Equipped with a wide aspect ratio 4K projection screen, the Auditorium provides a way for users to experience the C6 without being physically in the virtual environment. Students and researchers in the C6 wear head tracking as they interact with the virtual world, allowing computers to feed the viewing perspective to the Auditorium's screens. The audience can then observe what the C6 users are experiencing. A presentation using the other display augments the C6 feed with audiovisual lecture support. Enabled for 3D and 4K, the audience experiences near-theater grade surround sound, an astonishing feat for the time.

The system allowed for live camera feeds to be shared between the Auditorium and the C6. In this way, the audience in the Auditorium can see the virtual view the C6 users experience, and camera images from outside the C6 looking into the users inside. In addition, a wired and wireless production intercom system in the C6 ties to intercoms in the Auditorium and a distance education production site. As a result, individuals standing inside or nearby the C6 can interact with participants in the Auditorium for live Q&A sessions or commentary. This shared intercom allows a live event producer within the Auditorium to talk to camera operators in the C6 area for direction purposes.

Challenges

- Create two immersive environments which can interact with each other.

- Ensure the environments stand out architectural and technicologically.

Mechdyne

ENABLING DISCOVERY

The direct interaction between the virtual environment and the Auditorium demonstrates the importance of considering the end-user. Collaborative work and interaction need not be limited to individuals in the same environment. The power of ISU's auditorium extends beyond simple one-way knowledge transfer by bridging the physical and functional gap between users.

Near Broadcast Ready

Despite its location on a university campus, ISU also wanted the Auditorium to provide value to efforts beyond university business. Strategically making itself ready for any kind of presentation, ISU positioned themselves as the go-to venue in the state of Iowa.

The leadership behind Howe Hall understood the difficulty in finding a venue simultaneously compatible for large audience presentations and broadcast technology. It is not unusual for public and broadcast television stations to spend valuable time and resources spreading cabling, positioning audio equipment, and setting up video cameras in order to record important presentations, conferences, or addresses. Near broadcast ready, the Auditorium allows for nearly no pre-production

effort, coming equipped with top of the line video and sound capabilities, and direct access to high speed broadband.

Not only does this allow the university to host broadcasts for special speakers—such as NASA astronauts, foreign dignitaries, and presidential candidates—but shows the true power of what auditoriums can do. When the Auditorium was initially designed and built, it contained capabilities never before seen in a venue of its kind. "We were putting capabilities in the system we didn't know we wanted or needed yet," explains ISU's Paul Jewell, the Program Coordinator for Engineering-LAS Online Learning. "Within five years, we were astounded to look back and see we had used all that capability and more."

Updates

A lot changes over the course of a decade. Technology goes out of date and cannot keep up with the demands and expectations of new innovations. As waves of new technology and advancements push forward, ISU entrusts Mechdyne to make revisions best suited for the Auditorium and C6.
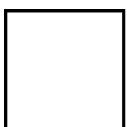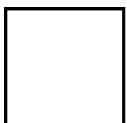
Researchers began to sacrifice a project's size, speed, realism, and human-computer interaction due to the C6's rendering limitations. In 2008, Mechdyne and ISU updated the C6 to what is now the highest resolution fully immersive environment in the world at 100 million pixels. The 24 Sony SRX-S105 digital cinema projectors provide what Kurt Hoffmeister, Mechdyne's vice president of engineering and product development, refers to as quad-HD. "The level of detail we can see allows a whole new realm of possibilities," says Hoffmeister. What originally was created for vast engineering projects now welcomes fields across the university. Engineers can develop analysis tools, architects

see 3D models of buildings or cities, biologists visualize data from up to 22,000 genes, and much more research is done every day.

Since original construction in 2000, Mechdyne has updated the auditorium for an entirely digital experience, including full support for both HDMI and HD-SDI ports for computer and broadcast capabilities. By upgrading projection technologies, AV capabilities, and switching from analog to digital, ISU's Auditorium continues to be one of the most advanced and innovative auditoriums in the country.

About Mechdyne

Mechdyne Corporation is a broad-based technology partner specializing in audiovisual and information technologies (AV/IT), visualization and software solutions, immersive virtual reality technologies, and technical support services. Mechdyne serves a global client base that includes leading government laboratories, university and research centers, energy, aerospace, manufacturing, and medical organizations, as well as any other user of advanced technology.